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What is claimed is:

1. A method for removing an oxide layer, comprising:

supplying a hydrogen gas in a plasma and a fluorine-containing gas onto a silicon wafer with an oxide layer on the surface thereof to induce a chemical reaction with the oxide layer; and

annealing the silicon wafer to vaporize a byproduct resulting from the chemical reaction.

2. The method of claim 1, wherein the inducing a chemical reaction step and the annealing step are repeated.

3. The method of claim 1, wherein the inducing a chemical reaction step and the annealing step are continuously carried out in a single chamber.

4. The method of claim 1, wherein the inducing a chemical reaction step is performed at a lower portion of a chamber and the annealing step is performed at an upper portion of the chamber.

5. The method of claim 1, wherein the inducing a chemical reaction step and the annealing step are continuously carried out in different processing modules in a single chamber.

6. The method of claim 5, wherein the inducing a chemical reaction step is performed in a downflowing module, and the annealing step is performed in an annealing module.

7. A semiconductor manufacturing apparatus for use in removing an oxide layer, comprising:

a vertically movable susceptor installed at a lower portion of a

processing chamber, for receiving a wafer thereon;

a heater installed at an upper portion of the processing chamber; and

a gas diffuser installed below the heater, for supplying reaction gases into the process chamber.

8. The semiconductor manufacturing apparatus of claim 7, wherein the susceptor has a cooling line therein for controlling a temperature of the wafer mounted thereon.

9. The semiconductor manufacturing apparatus of claim 7, wherein the gas diffuser comprises:

a gas supply line for receiving the reaction gases supplied via pipes installed outside the processing chamber; and

a porous plate forming the bottom of the diffuser, for evenly distributing the reaction gases into the processing chamber, wherein the diffuser is in flow contact with the gas supply line.

10. The semiconductor manufacturing apparatus of claim 9, wherein the pipes comprise:

a first pipe having a microwave guide for changing a gas mixture containing a hydrogen gas and a fluorine-containing gas in a predetermined ratio, or the hydrogen gas only, into a plasma state; and

a second pipe for supplying the fluorine-containing gas into the processing chamber.

11. The semiconductor manufacturing apparatus of claim 7, wherein the heater is one of a lamp and a laser.

12. A method of removing an oxide layer using a semiconductor manufacturing apparatus, comprising:

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(a) placing a vertically movable susceptor at a lower portion of a processing chamber and loading a wafer onto the vertically movable susceptor;

(b) supplying a cooling water or cooling gas into a cooling line in the susceptor to adjust a temperature of the wafer;

(c) flowing a hydrogen gas in a plasma state and a fluorine-containing gas into the processing chamber to induce a chemical reaction with the oxide layer on the wafer;

(d) moving the susceptor up to an upper portion of the processing chamber;

(e) annealing the wafer mounted on the susceptor with a heater installed at the upper portion of the processing chamber to vaporize a byproduct resulting from the chemical reaction; and

(f) exhausting the vaporized byproduct out of the processing chamber.

13. The method of claim 12, wherein after the step (f), the susceptor is moved back to the lower portion of the chamber and steps (b) to (f) are repeated one or more times.

14. The method of claim 12, wherein during the supplying the hydrogen gas in a plasma state and the fluorine-containing gas into the processing chamber, the hydrogen gas and the fluorine-containing gas are mixed in a predetermined ratio, changed into a plasma state, and then supplied into the processing chamber.

15. The method of claim 12, wherein during the supplying the hydrogen gas in a plasma state and the fluorine-containing gas into the processing chamber, the hydrogen gas is supplied in a plasma state into the processing chamber and the fluorine-containing gas is supplied in a non-plasma state into the processing chamber.

16. The method of claim 12, wherein the fluorine-containing gas is selected from the group consisting of NF_3, SF_6 and ClF_3.

17. The method of claim 12, wherein the mixing ratio of the fluorine-containing gas to the hydrogen gas is in a range of 0.1:1 to 100:1 by volume.

18. The method of claim 12, wherein the gas mixture containing the hydrogen gas and the fluorine-containing gas in a predetermined ratio is supplied in a plasma state into the processing chamber together with a nitrogen gas (N_2) and an argon gas (Ar).

19. The method of claim 19, wherein annealing the wafer is carried out using one of a lamp and laser.

20. The method of claim 19, wherein the laser is selecting from a group consisting of a neodymium (Nd)-YAG laser, a carbon dioxide (CO_2) laser, and an eximer laser.

21. A method of forming a dual gate oxide layer for a semiconductor device using a method of removing an oxide layer, comprising:

(a) forming a first gate oxide layer on a silicon wafer;

(b) forming etch barrier patterns on the first gate oxide layer;

(c) repeating the steps of:

placing a vertically movable susceptor at the lower portion of a processing chamber and loading the wafer onto the vertically movable susceptor placed at the lower portion of the processing chamber;

flowing a hydrogen gas in a plasma state and a fluorine-containing gas into the processing chamber to induce a chemical reaction with the first gate oxide layer exposed between the etch barrier patterns;

moving the susceptor up to an upper portion of the processing

chamber; and

annealing the wafer mounted on the susceptor with a heater installed at the upper portion of the processing chamber to vaporize a byproduct resulting from the chemical reaction, until the first gate oxide layer exposed between the etch barrier patterns is completely removed;

(d) removing the etch barrier patterns;

(e) chemically treating the surface of the wafer with a solution to remove organic particles which may be present on the wafer surface, and performing the step (c) to remove a natural oxide layer resulting from the step (d) and the chemical treatment; and

(f) forming a second gate oxide layer on the structure obtained in the step (e).

22. The method of claim 21, wherein the etch barrier patterns are photoresist patterns covering a region of the first gate oxide layer to be the dual gate oxide layer.

23. A semiconductor manufacturing apparatus for use in removing an oxide layer, comprising:

a rotary plate installed at the lower portion of a processing chamber;

a rotary motor installed at the center of the rotary plate, for rotating the rotary plate; and

a loading/unloading and post-processing module, a downflowing module and an annealing module, each of which is installed on the rotary plate around the rotary motor.

24. The apparatus of claim 23, wherein the downflowing module comprises:

a susceptor installed on the rotary plate to receive a wafer;

a vertically movable downflowing chamber which covers the susceptor

to form an enclosed space;

a gas diffuser installed at an upper portion of the downflowing chamber, for supplying reaction gases onto the wafer mounted on the susceptor; and

a gas supply pipe connected to the gas diffuser.

25. The apparatus of claim 24, further comprising guide rings at end portions of the downflowing chamber, providing smooth contact with the rotary plate on which the susceptor is mounted.

26. The apparatus of claim 24, wherein the gas diffuser is connected with a pipe having a microwave guide for changing a gas mixture containing a hydrogen gas and a fluorine-containing gas in a predetermined ratio, or the hydrogen gas only, into a plasma state.

27. The apparatus of claim 23, wherein the annealing module comprises:

a susceptor for receiving a wafer;

a vertically movable annealing chamber which covers the susceptor to form an enclosed space; and

a heater installed at an upper portion of the annealing chamber, for annealing the wafer.

28. The apparatus of claim 27, further comprising guide rings at end portions of the annealing chamber, providing smooth contact with the rotary plate on which the susceptor is mounted.

29. The apparatus of claim 23, wherein one or more downflowing modules and one or more annealing modules are installed on the rotary plate.

30. A method of removing an oxide layer using the semiconductor

manufacturing apparatus, the method comprising:

(a) loading a wafer onto a susceptor in a loading/unloading and post-processing module installed on a rotary plate of a processing chamber;

(b) operating a rotary motor installed at the center of the rotary plate to move the susceptor into a lower portion of a downflowing chamber in a downflowing module;

(c) moving the downflowing chamber down so that it contacts with the susceptor and the downflowing chamber thereby forming an air tight seal;

(d) supplying a hydrogen gas in a plasma state and a fluorine-containing gas into the downflowing chamber to induce a chemical reaction with the oxide layer on the wafer;

(e) moving the downflowing chamber up to an upper portion of the downflowing module apart from the susceptor, and moving the susceptor into the lower portion of an annealing chamber in an annealing module;

(f) moving the annealing chamber down so that is contacts with the rotary plate and the annealing chamber thereby forming an air tight seal;

(g) annealing the wafer with a heater installed at the upper portion of the annealing chamber to vaporize a byproduct resulting from the chemical reaction between the reactions gas and the oxide layer on the wafer; and

(h) exhausting the vaporized byproduct out of the annealing chamber.

31. The method of claim 30, after the step (f) further comprising:

moving the annealing chamber up to the upper portion of the annealing module apart from the susceptor;

moving the susceptor into the lower portion of a loading/unloading and post-processing chamber in the loading/unloading and post-processing module;

moving the loading/unloading and post-processing chamber down so that it contacts with the susceptor and the loading/unloading and post-processing chamber is made airtight; and

post-treating the wafer with the hydrogen gas.

32. The method of claim 30, wherein the steps (b) to (h) are sequentially repeated one or more times.

33. The method of claim 30, wherein the fluorine-containing gas is one selected from a group consisting of NF_3, SF_6 and ClF_3.

34. The method of claim 30, wherein the mixing ratio of the fluorine-containing gas to the hydrogen gas is in the range of 0.1:1 to 100:1 by volume.

35. The method of claim 30, wherein the heater is one of a lamp and a laser.

36. A method of forming a dual gate oxide layer for a semiconductor device using the method of removing an oxide layer, comprising the steps of:

(a) forming a first gate oxide layer on a silicon wafer;

(b) forming etch barrier patterns on the first gate oxide layer;

(c) repeating the steps of:

flowing a hydrogen gas in a plasma state and a fluorine-containing gas into the processing chamber to induce a chemical reaction with the first gate oxide layer exposed between the etch barrier patterns; and

annealing the wafer to vaporize the byproduct resulting from the chemical reaction, until the first gate oxide layer exposed between the etch barrier patterns is completely removed;

(d) removing the etch barrier patterns;

(e) chemically treating the surface of the wafer with a solution to remove organic particles which may be present on the wafer surface;

(f) performing the step (c) to remove a natural oxide layer resulting from the steps (d) and (e); and

(g) forming a second gate oxide layer on the structure obtained in the

step (f).

37. The method of claim 36, wherein the etch barrier patterns are photoresist patterns covering a region of the first gate oxide layer to be the dual gate oxide layer.